

## **REMARKS**

The Applicants express their appreciation to the Examiner for the courtesy of an interview which was granted to the Applicants' representative, Sanford T. Colb (Reg. No. 26,856). The interview was held at the Examiner's office at the USPTO on June 3, 2004. The substance of the interview is set forth in the Interview Summary. In the course of the interview, the claims were discussed in light of the Timmermans reference (US 3,855,543). The Examiner agreed to consider the addition of a proposed limitation of "a catalytic material deposited in finely divided form" in independent claims 1, 5, 7 and 10 as overcoming the reference. The Examiner agreed to contact the Applicants' representative if any additional issues arise.

The Applicants have carefully studied the outstanding Office Action. The present response is intended to be fully responsive to all points of rejection raised by the Examiner, and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

### **Claim rejections - 35 USC § 112 - second paragraph**

Claims 4 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 4 and 13 improperly use the term "comprising" instead of "consisting of" in a Markush group type of claim construction. Claims 4 and 13 have been amended to use the proper term "consisting of".

### **Claim rejections - 35 USC § 102**

Claims 10-14 stand rejected under 35 U.S.C. 102(b) as being anticipated by Timmermans et al. (US 3,855,543). Regarding claim 10, the Examiner asserts that "Timmermans discloses an electrically excited gas discharge lamp, whose output is characteristic of spontaneous emission of at least one IR-active gas species to a ground

state, comprising:

a lamp envelope containing a gas mixture comprising said at least one IR-activated gas species (see Fig. 1);

electrodes 2,3 for exciting said at least one IR-active species; and

a catalytic material 6 located within said lamp envelope.”

The applicants respectfully disagree with two aspects of the Examiner’s assertion regarding what is disclosed in Timmermans et al.

In the first place, the applicants submit that nowhere is there mentioned or suggested in Timmermans et al., the use of a catalyst, as claimed in the present invention. The so-called “catalytic material 6” cited by the Examiner is in fact a high reflectivity gold coating on an optical element constituting one of the cavity reflectors of the laser of Timmermans et al. Nowhere in Timmermans et al., are catalytic properties ascribed to this gold coating. Furthermore, to the best of the applicant’s understanding of the art, an infra-red reflective coating of the type described in Timmeremans et al., could not be used as a catalyst, since the catalytic effects described and claimed in the present application require that the coating preferably be in a finely divided form such that it is a non-conducting film, with a very high surface to volume ratio. Such a coating would be ineffective as the reflector of a laser cavity.

Secondly, the applicants respectfully submit that the Examiner is in error in his assertion that “Timmermans discloses an electrically excited gas discharge lamp, whose output is characteristic of spontaneous emission of at least one IR-active gas species to a ground state.” The IR source described in Timmermans et al., is a laser. There is an inherent difference between the discharge mechanism operative in lasers, and that operative in the discharge lamps of the present claimed invention. In the case of discharge lamps, the emitted radiation is a result of non-coherent, spontaneous emission from an excited state to the ground state. No metastable states are involved in this transition scheme. In a CO<sub>2</sub> laser, on the other hand, such as is described in Timmermans et al., the stimulated, amplified and emitted radiation produced by the laser is of a wavelength associated with a metastable transition, and no ground state

transitions are involved in the emission process.

This difference is significant in relation to the differences between a laser such as is described in Timmermans et al., and the discharge lamp as claimed in the present application. In the discharge lamps of the type claimed in the present invention, since a high proportion of the CO<sub>2</sub> molecules populate the ground level, the spontaneous radiation associated with the transition to this ground level is readily absorbed by these ground state molecules themselves, by the process of induced- or self-absorption. The lamp itself thus operates as an absorption cell to its own emitted light as this light passes to the output window through the lamp's own gas fill. The CO<sub>2</sub> lines are absorbed at their centers, and their shapes thus change by means of this self-absorption. Changes in CO<sub>2</sub> concentration thus affect the emission spectrum by means of this self-absorption process. The object of the presently claimed invention is specifically to prevent such changes in the emission spectrum, by the use of a catalytic material within the lamp envelope.

In CO<sub>2</sub> lasers, on the other hand, such as described in Timmermans et al., this phenomenon is, for all practical purposes, virtually non-existent, since a very low percentage of the molecules involved are to be found in the ground state. Furthermore, the radiation of interest produced, stimulated, amplified and emitted by the laser is of a wavelength associated with a metastable transition, and cannot thus be absorbed by any remaining molecules at ground level. Therefore, the effects of CO<sub>2</sub> decomposition on the spectrum of the lasing discharge, being related to the interaction of the discharge cell both as an emitter of the characteristic CO<sub>2</sub> lines, and as an absorption cell to these very emitted lines, is of minimal importance, if at all present.

In contrast to what is described in Timmermans et al., amended claim 1 of the present invention now recites:

“A method of constructing an improved, electrically excited, gas discharge lamp, comprising the steps of:

constructing a lamp envelope;

cleaning said lamp envelope; and

filling said envelope with a gas mixture comprising at least one IR-active

gas species, said gas species being such that said lamp provides **an output characteristic of spontaneous emission to a ground state** when electrically excited;

the improvement being the additional step of **including a catalytic material deposited in finely divided form** within said lamp envelope.” (Emphasis added)

The applicant respectfully submits that to the best of his understanding, nowhere is there shown or suggested in Timmermans et al., either of the two elements of amended claim 1 of the present application, outlined above in bold type. The applicant therefore respectfully submits that amended claim 1 is not anticipated by Timmermans et al., and is therefore free of these grounds for rejection.

Claims 2 to 4, amended where appropriate, are dependent on amended claim 1, and recite additional patentable matter. Claims 2 to 4 are therefore also deemed to be free of the assertion of being anticipated by Timmermans et al.

The applicants also respectfully submit that independent amended claims 5, 7 and 10, and their dependent claims 6, 8 to 9, and 11 to 17, amended where appropriate, for the same reasons as stated above, are also deemed to be free of the assertion of being anticipated by Timmermans et al.

#### **Claim rejections - 35 USC § 103(a)**

Claims 1-9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Timmermans et al. (US 3,855,543) in view of Muzeroll (US 5,340,346). The Examiner states that “Regarding claim 1, Timmermans discloses a method of making an electrically excited gas discharge lamp, whose output is characteristic of spontaneous emission of at least one IR-active gas species to a ground state, comprising:

constructing a lamp envelope; and

filling said envelope with a gas mixture comprising said at least one IR-activate gas species; and

including a catalytic material 6 located within said lamp envelope.

Timmermans is silent regarding the step of cleaning the lamp envelope. However, Muzeroll discloses a method of manufacturing a lamp and teaches to clean the lamp envelope in order to remove impurities and contaminants deposited within the envelope that can affect the discharge and lifetime of the device (see Col. 5, lines 17-21). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to clean the lamp envelope disclosed by Timmermans with the purpose of removing impurities and contaminants deposited within the envelope that can affect the discharge and lifetime of the device.”

The applicants respectfully submit that the Examiner’s base assertion, that Timmermans et al., discloses the invention as claimed with the exception of the step of cleaning the lamp envelope, is incorrect, for the reasons stated above in connection with the Examiner’s rejections under 35 U.S.C. 102(b). Therefore, no combination of other art in combination with Timmermans et al., can render claims 1-9 as obvious.

The applicants therefore respectfully submit that claims 1-9 of the present invention, as variously amended, are not rendered obvious in the light of Timmermans et al., and Muzeroll, and withdrawal of these grounds for rejection of those claims is respectfully requested.

### **New Claims**

New dependent claims 15 and 16 recite the subject matter lost by the preliminary amendment of claim 8 to a non-multiply dependent form.

New dependent claim 17 recites a further advantage arising from the reduced IR-active gas concentration arising from use of a catalyst in the lamps of the present invention. Support for this claim is to be found in the specification on page 11, second paragraph.

### Conclusion

The applicants respectfully submit that, in the light of all of the arguments mentioned above, all of the amended and originally filed claims 1 to 14, and new claims 15 to 17 are novel and unobvious over the prior art cited by the Examiner, and recite patentable material. Claims 1 to 17 are therefore all deemed to be allowable.

Reconsideration and prompt allowance of this application are therefore respectfully requested.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "S. Peter Ludwig", written over a horizontal line.

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